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PATENT

Customer No. 22,852

Attorney Docket No. 02860.0656-00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)
)
Shigeru HOSOE et al.) Group Art Unit: 2653
)
Application No.: 09/670,839) Examiner: Aristotelis M. Psitos
)
Filed: September 28, 2000)
)
For: OPTICAL ELEMENT HAVING A)
LOW SURFACE ROUGHNESS,)
AN OPTICAL PICKUP DEVICE)
INCLUDING THE OPTICAL)
ELEMENT, AND A DIE FOR)
MAKING THE OPTICAL)
ELEMENT)

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Technology Center 2600

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

REPLY TO OFFICE ACTION

This is a reply to the Office Action mailed on August 20, 2004, the period for response extending through November 22, 2004. Claims 1-8, 10-18, 22-26, and 28-30 are pending in this application.

In the Office Action, the Examiner rejected claims 1-4, 6, 10, and 25 under 35 U.S.C. § 103(a) as unpatentable citing Ueda et al. (U.S. Patent No. 5,481,530) and Hibino et al.; rejected claim 5 under 35 U.S.C. § 103(a) as unpatentable citing Ueda et al. ('530), Hibino et al., and Inoue et al.; rejected claims 7 and 8 under 35 U.S.C. § 103(a) as unpatentable citing Ueda et al. ('530), Hibino et al., and Sato et al.; rejected

claims 11 and 12 under 35 U.S.C. § 103(a) as unpatentable citing Ueda et al. ('530), Hibino et al., and Ueda et al. (6,314,064); rejected claims 13, 14, 18 and 30 under 35 U.S.C. § 103(a) as unpatentable citing Hibino et al. and Sato et al.; rejected claims 15, 16, 22, 23 and 24 under 35 U.S.C. § 103(a) as unpatentable citing Hibino et al., Sato et al., and Ueda et al. ('064); rejected claim 26 under 35 U.S.C. § 102(e) as anticipated by Hibino et al.; rejected claim 28 under 35 U.S.C. § 103(a) as unpatentable citing Takanobu (JP 11-268920), Hibino et al., Kashiwagi et al., and Yamagata et al. (WO 00/17691); and rejected claim 29 under 35 U.S.C. § 103(a) as unpatentable citing Takanobu, Hibino et al., Kashiwagi et al., and Yamagata et al.

Applicants respectfully traverse the Examiner's rejection of claim 26 under 35 U.S.C. § 102(e) as anticipated by Hibino. Independent claim 26 recites a molding die for an optical element. The claimed molding die comprises at least one aspherical surface having a center-line mean roughness Ra of not more than 5 nm. As cited by the Examiner, Hibino discloses, a base material having "an average roughness of less than 5 nm" (col. 4, lines 50-52). That particular base material has the inverse shape of a substrate for a magnetic disk (col. 4, lines 56-59). Applicants respectfully submit that Hibino fails to disclose at least the claimed aspherical molding surface of a molding die for an optical element and therefore fails to anticipate claim 26.

Applicants respectfully traverse the Examiner's rejections under 35 U.S.C. § 103(a) and respectfully submit that the pending claims distinguish over the prior art cited by the Examiner for at least the reasons discussed below.

Conventional CD readers employ a light source emitting light of a wavelength of about 780 nm, while DVD readers employ a light source emitting light with a wavelength

of about 650 nm. In contrast, the next generation of optical media readers are expected to employ light sources emitting light having wavelengths of less than 500 nm. As shown in Table 1 on page 3 of the present application, Rayleigh scattering suddenly increases as the wavelength of light decreases to 500 nm or less. In the next generation optical readers, as the light wavelength becomes 500 nm or less, the optical elements become more important. In particular, the surface roughness of the optical element influences the performance of reading and recording information from and to an optical recording medium. The present inventors recognized and responded to this influence.

Independent claim 1 recites an optical pickup device for recording and/or reproducing information in an optical information recording medium. The device includes a light source emitting light flux having a central wavelength not more than 500 nm, a converging optical system, and an optical detector. The converging optical system or the optical detector comprises at least one optical element, and that optical element comprises at least one optical surface having a center-line mean roughness R_a not more than 5 nm.

In rejecting claim 1, the Examiner relies on Ueda '530 as disclosing an optical recording system irradiating a laser beam at a wavelength of not more than 500 nm, but recognizes that Ueda makes no mention of the surface roughness of an optical element. The Examiner then relies upon Hibino as disclosing a press molding process for manufacturing glass elements and surface roughness. Neither Hibino nor Ueda '530 discloses the combination of a central wavelength not more than 500 nm and at least

one optical surface of an optical element having a center-line mean roughness Ra not more than 5 nm.

In addition, Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to combine the disclosures of Ueda and Hibino as suggested by the Examiner. As discussed above and as disclosed in this application, optical element surface roughness increases in importance as the radiation wavelength decreases. Following this disclosure, claim 1 limits both the wavelength and the corresponding surface roughness. Neither reference relied upon by the Examiner discloses or suggests the claimed combination or the correspondence between radiation wavelength and optical element surface roughness recognized by the Applicants. Therefore, Applicants respectfully submit that the prior art provides no motivation to achieve the claimed invention.

Independent claim 13 recites an optical element comprising at least one optical surface. The optical surface has a center-line mean roughness Ra not more than 5 nm and at least one surface of the optical surface of the optical element has a reflectance not more than 3% for light having at least a wavelength of 300 nm to 500 nm.

Applicants respectfully submit that none of the prior art cited by the Examiner teaches or suggests the claimed combination including, but not limited to, a surface roughness Ra not more than 5 nm and a reflectance not more than 3% for light having at least a wavelength of 300 nm to 500 nm. As discussed above, none of the prior art references cited by the Examiner teach or suggest the claimed combination of surface roughness and wavelength. Surface roughness and reflectance are not functional limitations, but describe physical properties of the claimed optical element. In addition,

while the Examiner relies upon Sato as disclosing the relationship between reflectance and wavelength, Sato fails to disclose or mention surface roughness.

Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to combine the disclosures of Hibino and Sato as suggested by the Examiner. For example, Sato discloses a multi-layered anti-reflection film directly or indirectly on an optical component and thus teaches away from any optical element disclosed in Hibino.

Independent claim 25 recites an optical information recording and/or reproducing apparatus for recording and/or reproducing information in an optical information recording medium. The optical pickup device includes a light source emitting light flux having a central wavelength not more than 500 nm, a converging optical system, and an optical detector. The converging optical system or the optical detector comprises at least one optical element, and that optical element comprises at least one optical surface having a center-line mean roughness Ra not more than 5 nm.

As explained for independent claim 1, the cited prior art fails to teach or suggest the combination of elements recited in independent claim 25.

Independent claim 28 recites a method of manufacturing a molding die for an optical element. The method comprises the steps of cutting a material of the molding die with a super precision lathe and a diamond tool and forming an optical surface transferring surface in the molding die. The optical surface transferring surface comprises at least one surface having a center-line mean roughness Ra not more than 5 nm.

Applicants respectfully submit that the prior art cited by the Examiner fails to teach, disclose, or suggest the method recited in independent claim 28. The Examiner relies on Yamagata as disclosing a "diamond tool", but apparently admits that Yamagata does not disclose an "Ra of 5 nm or less." Further, according to Applicants, Yamagata fails to disclose a super precision lathe. In addition, while Kashiwagi discloses a diamond tool (col. 6, lines 7-9), Kashiwagi, according to Applicants, fails to disclose a super precision lathe or the combination of a super precision lathe and a center-line mean roughness Ra not more than 5 nm.

Independent claim 30 recites an optical element comprising an optical surface. The optical surface has a center-line mean roughness Ra not more than 5 nm and a reflectance not more than 5% for light having a wavelength of 400 nm. Applicants respectfully submit that new claim 30 is patentable at least for the same reasons discussed for claim 13.

While not specifically discussed above, dependent claims 2-8, 10-12, 14-18, 22-24, and 29 are patentable for at least the same reasons as independent claims 1, 13, 25, 26, 28, and 29, as well as for the additional limitations and combinations recited within those dependent claims.

In view of the foregoing amendments and remarks, Applicants respectfully request reconsideration and reexamination of this application and the timely allowance of the pending claims.

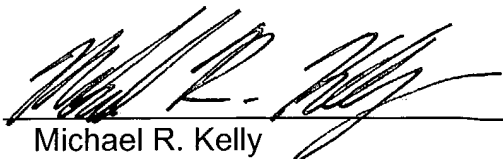
Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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Dated: November 22, 2004

By:


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